



An ARDL-Based Analysis of the Short and Long-Run Impact of Agricultural Exports on Gross Agricultural Income in South Africa (1990-2022)

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ABSTRACT

Agriculture continues to play a vital role in promoting economic transformation, supporting sustainable livelihoods and advancing development in many developing nations. Agriculture has long been seen simply as a provider of food and fibre, but in today's world it is increasingly recognised for its broader and more meaningful role, one that extends far beyond this traditional view. Despite experiencing considerable growth in agricultural exports in recent years, the agricultural sector's gross income failed to reflect a proportional increase. The study aimed to estimate both the short and long-run effects of the agricultural exports on the gross income of the agricultural sector in South Africa from 1990 to 2022. The study utilized an autoregressive distributed lag model to address the objective of the study. Secondary annual data of the total value of agricultural exports, gross income of the agricultural sector, gross domestic product, net farming income and contribution of the agricultural sector to gross domestic product were utilised. The data was collected from different sources, covering the period from 1990 to 2022. Autoregressive distributed lag model results revealed the presence of both short and long-run effects between agriculture exports and gross income. The study recommends strengthening of agricultural export performance through value addition, quality improvement and market expansion while mitigating short-run income volatility via diversification and risk management strategies.

Keywords: Agricultural Exports, Gross Income, Autoregressive-Distributed Lag Model

JEL Classifications: Q17, Q11, C22, F14

1. INTRODUCTION

Agriculture remains crucial in driving economic transformation, sustainable livelihoods, and development in developing countries (Nhemachena et al., 2020). The study conducted by Loizou et al. (2019) adds that in developed countries, agriculture has long been overlooked as a key economic sector and its purpose in national economic growth is frequently underestimated. The study further proffers that traditionally, agriculture is considered a sector that provides food and fibre; although in contemporary economies, long discussions exist on its indirect historical role, beyond the perceived traditional one.

Total agricultural exports of South Africa reached a new milestone of US\$13.2 billion in 2023, rising by 3% from the prior year, which is stronger than the initial forecasts of a moderate export activity this year (Agricultural Business Chamber, 2024). Continued investment in agricultural research will have a significant impact on the economy as it would ensure that the sector maintains its international competitiveness and results in a positive trade balance (Grain, 2015; Arisoy, 2020). Despite experiencing considerable growth in agricultural exports in recent years, the agricultural sector's gross income failed to reflect a proportional increase. This is evident from the Department of Agriculture, Land Reform and Rural Development (2023), which reported that the total

income earned in the agricultural sector was R37 9863,8 million in 2022 compared with R36 7772.2 million in 2021 (3.29% increase). However, the total export value of agricultural products was R210 913.9 million for 2022 and R177 489.4 million for 2021 (18.8% increase), calendar year (Department of Agriculture, Land Reform and Rural Development, 2023).

This discrepancy raises concerns about how well the positive outcomes from exports contribute to economic gains. The study conducted by Osabohien et al. (2019) noted that export expansion boosts the economic growth of developing countries through the multiplier effects that the income earned from exports has on the economy. Thus, the growth in agriculture and its positive impacts on the country's economy can be due to more South African agricultural products being sold internationally. Scholars (Bulagi et al., 2015; Toyin, 2016; Mlambo et al., 2019; Seok and Moon, 2021) have studied the contribution or rather the relationship of agricultural exports to the economic growth and GDP of South Africa. However, the magnitude to which the exports influence the gross income of the agricultural sector of South Africa remains unclear. By examining the short and long-run effects of agricultural exports and the gross income of the agricultural sector, the researcher sought to understand the dynamics between agricultural exports and the overall financial performance of the sector. The aim of the paper was realized through the following specific objective:

1. Estimate both the short and long-run effects of the agricultural exports on the gross income of the agricultural sector in South Africa from 1990 to 2022.

2. THEORETICAL FRAMEWORK

This study examines the short- and long-run impact of agricultural exports on gross agricultural income in South Africa using an ARDL approach. The analysis is anchored on four complementary theoretical perspectives: the absolute advantage theory, comparative advantage theory and export-led growth theory. Together, these theories explain why agricultural exports may influence sectoral income through trade efficiency, specialization and market expansion.

The foundation of international trade analysis originates from the absolute advantage theory developed by Adam Smith. The theory posits that countries benefit from specializing in the production of goods they can produce more efficiently than others and trading for goods produced less efficiently (Osagie and Ukwuoma, 2022). In the South African context, this implies that the country's abundant resources can create efficiency advantages in the production of specific agricultural commodities. By specializing in these products, South Africa can expand its exports, potentially increasing revenue and contributing to higher gross agricultural income.

Building on this perspective, the comparative advantage theory introduced by David Ricardo argues that even when a country lacks absolute efficiency, it can still benefit from trade by specializing in goods produced at relatively lower opportunity costs (Rahman, 2023). This theory is particularly relevant to South Africa's agricultural sector, where resource allocation toward commodities

with cost advantages can improve export performance. Through specialization and trade, comparative advantage suggests that agricultural exports can enhance productivity, resource utilization and ultimately sectoral income.

The export-led growth theory further links trade performance to economic expansion. Promoted by scholars such as Béla Balassa, this perspective contends that export expansion stimulates growth through increased foreign exchange earnings, economies of scale, technological diffusion, and improved competitiveness (Hamberg, 2023). Applied to agriculture, increased export activity may raise farm revenues and strengthen sectoral income. This theory provides the macroeconomic justification for examining both short-run adjustments and long-run equilibrium relationships between exports and income using ARDL modelling.

Collectively, these theoretical perspectives provide a comprehensive foundation for this study. Absolute and comparative advantage theories explain specialization and trade incentives. Lastly, export-led growth theory connects exports to income expansion. These frameworks justify the empirical investigation of both short- and long-run relationships between agricultural exports and gross agricultural income in South Africa.

3. BRIEF LITERATURE REVIEW

The South African economy was in crisis before the democratic elections of 1994. Over the past 20 years, South Africa has shifted its trade policy strategy. In the early 1990s, the new government reduced tariffs significantly, and this was influenced by global and regional agreements, and its own economic policies (Vickers, 2014).

During apartheid, South Africa focused on exporting capital-intensive goods due to its natural resources but government policies made it hard to export other manufactured products (Edwards and Lawrence, 2008). This South African trade policy has exerted a major influence on the composition and aggregate growth of trade. As a result, the country gained an advantage in resource-based exports. Initially, the South African economy's growth surpassed agriculture by increasing consistently faster than agriculture until 2013, after which agricultural growth exceeded it and by some margin (Agricultural Business Chamber and Bureau for Food and Agricultural Policy, 2025).

The BFAP statistical compendium further remarked that agriculture's strong performance in the past decade also indicated that on average, it surpassed all other non-agricultural sectors combined in the democratic era. The agricultural sector has been subjected to many challenges including, climate change, pests and disease and land reform and redistribution complexities since 1994 (Coutinho and Van der Waals, 2024). Nonetheless, it holds promise for future growth and development, both locally and globally. However, Farahane and Heshmati (2020) noted that some economists claim that the effect of trade on economic growth is not always clear or predictable.

The study by Greyling et al. (2015) on South Africa's agricultural sector 20 years after democracy year 1994-2013, noted that South

Africa's agricultural sector has experienced significant policy reform since the dawn of democracy in 1994. Moreover, the study revealed that trade and marketing policy reform has succeeded in innovating the sector towards increased productivity and international competitiveness. Consequently, this has increased the market and climate resilience of the sector. Similarly, Lundahl and Petersson's (2013) research aligns with these findings, which highlighted that South Africa has successfully navigated the transition from apartheid to democracy, its government has made remarkable gains in anchoring the economy and setting a firm foundation for higher economic growth.

The World Bank argued that the agricultural sector has been between 2 and 4 times more significant in reducing poverty than growth stemming from other sectors (KPMG, 2014). The prerequisites for rapid, intensification-driven output growth might not be available in Africa (Bachewe et al., 2018). In recent years, policymakers have been focusing more on export growth strategies to stimulate growth prospects (Osei-Assibey and Dikgang, 2020). The study further propounded that managing external shocks, including exchange rate volatility and global economic sentiment, is essential for strong and sustainable long-run export-driven economic and import growth.

The effect of agricultural exports on economic growth is a controversial and long-standing topic in research and in policymaking. Hence, on the short and long-run effect between agricultural exports and other macro-economic variables, a wide variety of empirical studies have been conducted by different authors and different outcomes were obtained.

Osabohien et al. (2019) used the Autoregressive Distribution Lag (ARDL) econometric technique to analyse the long run relationship and the impact of agricultural exports on Nigeria's economic growth. The results revealed that agricultural exports have a long-term relationship with economic growth. Similarly, Bakari and Tiba (2022) utilised ARDL bounds testing for the study period from 1984 to 2017, and the study revealed that in the long-run, agricultural exports have a positive effect on the economic growth of China. Furthermore, the study reported a positive and significant effect of agricultural exports on economic growth in the short run.

Iqbal et al. (2023) also employed ARDL, which revealed that exports have a significant positive long-run impact on economic growth in BRICS countries. Harawa (2024) evaluated the short and long-run impact of export commodities on the real GDP by using the ARDL model on time series data spanning from 1969 to 2019. The study revealed a long-run relationship between agricultural exports and economic growth. Furthermore, the study's findings also revealed that only sugar export has a positive and significant impact on economic growth both in the short and long-run. Hlongwane (2020) noted that certain pairs of economic or financial variables should be linked by a long-run economic relationship. Adenew and Woldeyohannes (2020) employed the ARDL model and the Granger causality method. The long run analysis results obtained showed that agricultural export has a positive and significant effect on economic growth and in the short run, agricultural exports have no significant effect on economic growth in Ethiopia.

Contrary to the findings above, the empirical results of Bakari (2017) show that in the long run, exports have a negative effect on economic growth; however, in the short run, exports cause economic growth in Gabon. The study employed annual time series data from 1980 to 2015 by implementing cointegration analysis and error correction model. Likewise, Alemayehu and Tilahun (2021) also found no long-run relationship between agricultural export and economic growth from the Engel granger co-integration test.

Nugroho et al. (2021) argue that the agricultural sector is the primary source of survival in developing countries. At the same time, these countries have been incapable of optimising their agricultural value-added and only earn a low-level income. The authors further suggested that developing countries must take advantage of Economic Globalisation (EG) to increase income from agricultural exports and farmers' well-being. The study utilised the panel data technique to assess the impacts of economic globalisation on agricultural value added in 17 developing countries during from 2006 to 2018. The conclusion was that foreign direct investment inflows and agricultural export values increase agricultural value addition in developing countries and the study recommended that the foreign investors collaborate with local agricultural firms, increase agricultural exports and create a conducive economic system. Sahoo and Dash (2022) adds that foreign direct investment inflows encourage exports and higher exports attract more foreign direct investment. Consequently, this might increase the result of the agricultural sector.

4. METHODOLOGY

4.1. Study Area

Figure 1 illustrates a map of the study area. The study of impact analyses of the short and long-run effects of the agricultural exports on the gross income of the agricultural sector (1990-2022): An autoregressive distributed lag approach was conducted in South Africa, which has nine provinces. South Africa lies on the southern tip of the African continent, with the Atlantic Ocean on the west coast and the Indian Ocean on the east coast.

4.2. Unit Root

The augmented Dickey-Fuller (ADF) test was used to test for unit root existence as a mandatory step for time-series data. According to Ngoben and Muchopa (2022), unit root testing is used to determine whether time-series data are stationary. This step is crucial because analyses based on non-stationary series are only valid for the specific sample period and cannot reliably be used to forecast future values. Stationarity testing holds significant importance in the field of research due to the widespread presence of trend or non-stationarity in financial and economic time series data (Aphane et al., 2024). The study employed Augmented Dickey-Fuller (ADF) to check for stationarity. In accordance with the general model proposed by Dickey and Fuller (1979) shown below:

$$\text{General model: } \Delta Y_t = \alpha + \beta_t + \rho Y_{t-1} + \rho n \Delta Y_{t-n} + \varepsilon_t \quad (1)$$

$$\text{Specific models: } \Delta TVE_t = \alpha + \beta_t + \rho TVE_{t-1} + \rho n \Delta TVE_{t-n} + \varepsilon_t \quad (2)$$

$$\Delta AGI_t = \alpha + \beta_t + \rho AGI_{t-1} + \rho n \Delta AGI_{t-n} + \varepsilon_t \quad (3)$$

$$\Delta NFI_t = \alpha + \beta_t + \rho NFI_{t-1} + \rho n \Delta NFI_{t-n} + \varepsilon_t \quad (4)$$

$$\Delta GDP_t = \alpha + \beta_t + \rho GDP_{t-1} + \rho n \Delta GDP_{t-n} + \varepsilon_t \quad (5)$$

$$\Delta CAS_t = \alpha + \beta_t + \rho CAS_{t-1} + \rho n \Delta CAS_{t-n} + \varepsilon_t \quad (6)$$

Model hypotheses: H_0 =Non-stationary and H_A =stationary

Where: ΔTVE_t , ΔAGI_t , ΔNFI_t , ΔGDP_t and ΔCAS_t are changes in the total value of exports, agricultural gross income, net farming income, gross domestic product and contribution of the agricultural sector to GDP at time t , respectively. TVE_{t-1} , AGI_{t-1} , NFI_{t-1} , GDP_{t-1} and CAS_{t-1} are lagged values; ΔTVE_{t-n} , ΔAGI_{t-n} , ΔNFI_{t-n} , ΔGDP_{t-n} and ΔCAS_{t-n} are the changes in lagged values; β and ρ are coefficients; α is the intercept and ε_t is the error term.

4.3. Autoregressive Distributed Lag (ARDL) Model

To address the third objective of the study, which was to estimate both the short-run and long-run effects of agricultural exports on the gross income of the agricultural sector, the Autoregressive distributed lag model known as the ARDL bounds testing approach to integration for the long run relationship was employed.

General equation

$$\Delta Y_t = \beta_0 + \sum_{i=1}^n \beta_1 \Delta Y_{t-i} + \sum_{i=0}^p \delta_i \Delta X_{t-i} + \varphi_1 X_{t-1} + \varphi_2 X_{t-1} + \mu \quad (7)$$

Where ΔY_t represents the change in the natural log value of the dependent variable at time t , Δ stands for the first difference and β_1 and δ_i indicates the short-run relationships whereas φ_1 and φ_2 denotes the long-run relationships, β_0 represents the intercept, ΔX_t represents the change in the natural log value of the independent variable at time t and the variable's value one period ago (lag operators) for the dependent variable and regressor are represented by n and P , respectively.

MODEL SPECIFICATION

$$\begin{aligned} \Delta AGI_t = & \beta_0 + \sum_{i=1}^n \beta_1 \Delta AGI_{t-i} + \sum_{i=0}^{P1} \delta_i \Delta TVE_{t-i} \\ & + \sum_{i=0}^{P2} \delta_i \Delta NFI_{t-i} + \sum_{i=0}^{P3} \delta_i \Delta GDP_{t-i} \\ & + \sum_{i=0}^{P4} \delta_i \Delta CAS_{t-i} + \varphi_1 AGI_{t-1} \\ & + \varphi_2 TVE_{t-1} + \varphi_3 NFI_{t-1} + \varphi_4 GDP_{t-1} + \varphi_5 CAS_{t-1} + \mu \quad (8) \end{aligned}$$

(Where AGI is the agricultural gross income, β_0 is the intercept, TVE is the total value of exports, NFI is the net farming income, GDP is the Gross domestic Product, CAS is the contribution of agricultural sector to GDP, t is a certain time dimension, n is the lag operator of dependent variable (agricultural gross income), p is the lag operator for independent variables and μ is the error term.

If cointegration exists, you can proceed to estimate an Error Correction Model (ECM).

$$\Delta Y_t = \alpha + \sum B_i \Delta Y_{t-1} + \sum \delta_j \Delta X_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad (9)$$

Where the coefficients of differenced variables ΔX_{t-1} show short-run effects.

5. RESULTS AND DISCUSSION

5.1. Unit Root Results

The notion of stationarity is that the probability value should be <0.05 , and the ADF test statistic should be less than the critical value at 5% (R Rosca, 2011).

Table 1 indicates the results of the ADF stationarity test at levels. This study required all variables to be stationary to ensure the validity of the models used and to reduce the likelihood of spurious regression results. Phillips (1986) noted that non-stationary variables can produce estimates that appear statistically significant but are meaningless. Ghouse et al. (2024) further confirmed that spurious regressions arise from non-stationarity. Therefore, the study performed unit root tests at the first difference rather than at levels.

Table 2 illustrates results from first difference; all series were found to be stationary at trend and intercept. This met the study's requirements and allowed the appropriate models to be applied for data analysis.

5.2. Autoregressive Distributed Lag Model (ARDL) Results

This study presents the ARDL bound test cointegration to estimate the long-run effects of the agricultural exports on gross income of the agricultural sector. The results are presented on Table 3 below.

5.2.1. ARDL bound test results

The results of the ARDL bounds test presented in Table 3 reveal the F-statistic value of 3.8675, which lies above the upper bound critical value at the 10% significance level (2.46) and critical value at 5% significance level (2.947). This suggests the existence of a long run cointegration relationship between the variables in the model at the 10% and 5% significance level. This means that the alternative hypothesis of no-cointegration between the variables is rejected. This supports the idea of Hlongwane (2020) who noted that certain pairs of economic or financial variables should be linked by a long economic relationship. Empirically, this finding corroborates studies by Harawa (2024), Iqbal et al. (2023), Bakari and Tiba (2022), and Bakari (2017), all of whom reported a long-run contribution of agricultural exports to economic and sectoral performance.

In the South African context, this result reflects the role of agricultural exports in increasing the sector's income through foreign exchange earnings, even during periods of currency depreciation, as discussed by Vink and Van Rooyen (2009). The finding also reinforces Vincent et al. (2021), who argued that rising agricultural exports enhance foreign earnings and strengthen total agricultural revenue.

Table 1: Augmented Dickey-Fuller unit root test results at levels

Variables	Test equation	ADF Statistics	Critical value at 5%	Probability value	Outcome
TVE	Intercept	4.943059	-2.957110	1.0000	Non- stationary
	Trend and intercept	1.432163	-3.562882	1.0000	Non- stationary
AGI	Intercept	4.003374	-2.963972	1.0000	Non- stationary
	Trend and intercept	0.250312	-3.580622	0.9972	Non- stationary
NFI	Intercept	-0.552314	-2.957110	0.8676	Non- stationary
	Trend and intercept	-2.523894	-3.568379	0.3152	Non- stationary
GDP	Intercept	-0.950428	-2.957110	0.7585	Non- stationary
	Trend and intercept	-4.772098	-3.603202	0.0042	Stationary
CAS	Intercept	-2.241982	-2.957110	0.1962	Non- stationary
	Trend and intercept	-2.241982	-2.957110	0.1962	Non- stationary

Source: Researcher's compilation (2025)

Table 2: Augmented Dickey-Fuller unit root test results at first difference

Variables	Test equation	ADF statistics	Critical value at 5%	Probability value	Outcome
TVE	Intercept	-0.661063	-2.963972	0.8417	Non- stationary
	Trend and intercept	-6.333621	-3.562882	0.0001	Stationary
AGI	Intercept	-0.087272	-2.998064	0.9398	Non-stationary
	Trend and intercept	-4.923390	-3.580622	0.0025	Stationary
NFI	Intercept	-1.394300	-2.998064	0.5671	Non-stationary
	Trend and intercept	-7.697375	-3.622033	0.0000	Stationary
CAS	Intercept	-6.072950	-2.960411	0.0000	Stationary
	Trend and intercept	-5.507464	-3.225334	0.0006	Stationary

Table 3: ARDL bound test results

Test statistics	Value	K
F-statistics	3.867521	4
Critical value		
Significance level (%)	I (0)-UB	I (1)-LB
10	2.46	3.46
5	2.947	4.088
1	4.093	5.532

UB and LB represent lower and upper bound respectively

The ARDL long-run estimation presented in table 4 revealed that the estimated long-run coefficient of total value of agricultural exports (TVE) is 1.75, indicating a positive relationship between agricultural exports and the gross income of the agricultural sector in South Africa. This coefficient implies that, in the long run, a 1% increase in the total value of agricultural exports leads to an approximate 1.75% increase in agricultural gross income, holding other factors constant. The coefficient is statistically significant ($P < 0.05$), suggesting that the observed relationship is unlikely to have occurred by chance. The relatively small standard error further confirms the reliability and precision of the estimated coefficient.

From an economic perspective, the magnitude of the coefficient indicates that agricultural exports play a substantial role in enhancing sectoral income, emphasising the role of export performance in supporting long-term agricultural growth. These results are similar to the findings of Harawa (2024); Iqbal et al. (2023); Bakari and Tiba (2022); Bakari (2017) which revealed agricultural exports to be somehow contributing to the economy positively in the long-run. The alignment with these studies reinforces the argument that export-oriented agricultural strategies can serve as a viable pathway for enhancing income generation and long-term sectoral sustainability. However, they are not in line with the findings of Alemayehu and Tilahun (2021) and Nyamekye et

al. (2021) who found no long-run relationship between agricultural exports and their contribution to the economy.

Other variables such as the contribution of agriculture to the GDP, GDP and net farming income were not statistically significant.

5.2.2. Error correction model estimates for short-run effect

After estimating the long-run co-integrating test, the short-run dynamic relationship among the variables within the ARDL framework was examined.

Table 5 presents ARDL short-run estimates. The table indicated the short-run estimates obtained from differenced variables under study together with the speed of adjustment towards the equilibrium. Results from Table 5 estimated how differenced GDP, net farming income, total value of exports and contribution of agricultural sector to GDP affect agricultural gross income in the short run.

In the short run, GDP exhibits a negative and statistically significant effect on gross income of the agricultural sector through its lagged components. Specifically, the first lag of GDP, GDP (-1) has a coefficient of -118.0965 and is highly significant, while the second and third lags also exhibit significant negative effects. These results suggest that past increases in overall economic output may adversely impact agricultural income in the short run. Similarly, the total value of agricultural exports, represented by D(TVE), shows a negative short-run impact on agricultural gross income (AGI) through their first and second lagged differences. First and second lags of agricultural exports are both statistically significant with negative coefficients, indicating that while exports may increase, their immediate effect on income is adverse. This phenomenon might possibly be due to export volatility or delayed revenue realization. According to Sarin et al. (2022), export diversification has potential for reducing exogenous shocks in

Table 4: Estimated long-run coefficients using the ARDL approach

Variable	Coefficient	Std. Error
C	61231.41	71353.02
Agricultural exports (TVE)	1.752825*	0.829547
Contribution of agricultural sector (CAS) to GDP	-24533.23	28469.88
Gross domestic product (GDP)	433.2108	649.1542
Net farming income (NFI)	1.317938	71353.02

*means statistically significant at 10% level

Table 5: Error correction model estimates for short-run effect

Variable	Coefficient	Std. Error
ΔAGI_{t-1}	0.039926	0.189481
ΔAGI_{t-2}	-0.641599	0.187107
ΔAGI_{t-3}	-0.379916	0.176364
ΔGDP	23.95524	21.92319
ΔGDP_{t-1}	-118.0965***	24.67448
ΔGDP_{t-2}	-70.11156**	25.98850
ΔGDP_{t-3}	-83.93867**	25.98850
ΔTVE	0.131568	0.136357
ΔTVE_{t-1}	-0.820480***	0.171670
ΔTVE_{t-2}	-0.605723***	0.159933
ΔCAS	2448.215	3178.991
ΔCAS_{t-1}	9255.077**	3027.345
ΔCAS_{t-2}	7452.928**	2663.756
ΔNFI	0.712796***	0.072741
ΔNFI_{t-1}	-0.035313	0.137160
ΔNFI_{t-2}	0.191853	0.174807
ΔNFI_{t-3}	0.387379**	0.140134
ECM (-1)	-0.233916***	0.035863

*, **, *** means statistically significant at 10%, 5% and 1%, respectively

the form of global business cycle, international commodity price fluctuation, natural disaster and so on. This short-run negative export effect may be due to limited export diversification, which can increase export earnings volatility and cause short-term instability in agricultural income.

In contrast, the contribution of agriculture to GDP (CAS) demonstrates a positive and statistically significant effect on gross income through its lagged values. While the contemporaneous change in the contribution of agriculture to GDP is not statistically significant, both the first and second lagged differences are significant at the 5% level with large positive coefficients. These findings imply that when agriculture becomes a larger part of the overall economy, it positively influences agricultural income, but this effect materialises after a lag probably because of market correction dynamics or adjustment toward equilibrium. The results also revealed that net farming income has a significant and positive short-run effect on gross agricultural Income.

The coefficient for the current change is positive and is highly statistically significant, indicating that immediate increases in farm-level profitability led to substantial improvements in overall agricultural income. Additionally, the third lag of net farming income is also positive and statistically significant, suggesting that increases in net farming income continue to exert a meaningful impact on the gross income of the agriculture even after 3 years.

Figure 1: Map of South Africa



Source: Ontheworldmap.com

In contrast, the first and second lagged differences of net farming income are not statistically significant, implying that the short-term effect of net farming income on gross income is strongest either immediately or after a more extended period, rather than in the intermediate years. While studies such as Harawa (2024), Iqbal et al. (2023), Bakari and Tiba (2022), and Bakari (2017) report positive export effects, their emphasis on aggregate economic performance may obscure short-run sectoral adjustment frictions, which this study captures more explicitly. Conversely, the short-run negative export effect observed here is consistent with Adenew and Woldeyohannes (2020) and Nyamekye et al. (2021), who found limited immediate income benefits from agricultural export expansion, highlighting the importance of time lags and structural conditions in determining export-income outcomes.

The error correction term (ECM) is negative and statistically significant, with a coefficient of approximately -1 , which confirms the existence of a stable long-run relationship between agricultural exports and the gross income of the agricultural sector. The negative sign of the ECM coefficient is consistent with economic theory and indicates that deviations from the long-run equilibrium are corrected over time.

The magnitude of the coefficient (-1) suggests a high speed of adjustment, implying that approximately 100% of short-run disequilibrium in agricultural gross income is corrected within one period following a shock. This indicates that the agricultural sector adjusts rapidly toward its long-run equilibrium path after disturbances such as export price fluctuations or changes in export volumes. This interpretation aligns with the error-correction literature, which shows that economic systems return to long-run equilibrium after shocks, with adjustment speeds varying by shock type and model specification (Mallick and Behera, 2020).

6. CONCLUSION AND RECOMMENDATION

The primary objective of the study was to estimate both the short and long-run effects of the agricultural exports on the gross income

of the agricultural sector in South Africa from 1990 to 2022. Unit root results from the augmented Dickey Fuller (ADF) revealed that one variable was stationary at levels and other variables were stationary at first difference under trend and intercept. Autoregressive distributed lag model results showed that both the short and long-run effects exist between agricultural exports and gross income of the agricultural sector in South Africa.

Given that agricultural exports significantly increase the gross income of the agricultural sector in the long run, this study recommends that government policies should focus on enhancing export performance through value addition, improving product quality and expanding access to high-value international markets to sustain and boost sectoral income. government policies ought to prioritise mitigating short-run volatility in agricultural income by stabilising export earnings through diversification strategies, risk management mechanisms and timely revenue collection.

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